

January 27, 2000

**Staff Report by the  
Division of Water Quality**

**WORKPLAN FOR DEVELOPING A COMPREHENSIVE SURFACE  
WATER AMBIENT MONITORING PROGRAM**

***Introduction***

This workplan presents the goals and tasks necessary to implement a comprehensive Surface Water Ambient Monitoring Program (SWAMP). SWAMP is proposed as a multi-year program to assess the effectiveness of the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCB) programs in protecting water quality, and to provide timely and useful information that will be used to improve water quality program effectiveness. This Plan presents the assumptions used, the goals of the plan, the objectives to be completed, and the tasks necessary to develop and implement SWAMP. Much of the approach presented here is adapted from a National Research Council (NRC) report on marine monitoring (NRC, 1990).

***Ambient Monitoring and the SWRCB Strategic Plan***

Monitoring is a key component of the SWRCB's Strategic Plan (1997). One of the goals of the Strategic Plan is to preserve, enhance, and restore water resources while balancing economic and environmental impacts. To accomplish the goal, the SWRCB has committed to employing sound-scientific methods, data, and tools to: (1) characterize our natural resources and the communities that depend upon them; (2) specify the appropriate water-related environmental objectives for specific water bodies given resource availability and economic impact; and (3) identify and prioritize all issues and problems preventing the SWRCB from realizing the environmental objectives.

The SWRCB is also committed to develop and implement action plans, monitor and evaluate the effectiveness of our actions, and make appropriate modifications to continually improve our water resources. One of the SWRCB's strategies is to evaluate, propose, and establish new long-term monitoring and assessment mechanisms to appraise SWRCB and RWQCB progress in meeting environmental objectives.

***Assumptions***

The following assumptions were made in the development of the Plan:

1. SWAMP will begin the process required in the Water Code and the Budget Act for implementing comprehensive monitoring (e.g., AB 982).
2. SWAMP will not address the need for or requirements of compliance monitoring.
3. The design of SWAMP will address the process for listing "water quality limited segments" under CWA Section 303(d).

4. SWAMP will be adaptable (i.e., changeable with changing circumstances and resources).
5. The data produced by SWAMP will be comparable to the data produced by other programs operating in the State, and the data will be made available through the World Wide Web.
6. To the extent possible, SWAMP will produce information that is representative of changes in the environment.
7. SWAMP will be built on a foundation of the best scientific information that is currently available and feasible.
8. SWAMP will be developed and implemented in a public process.

### ***Goals***

1. Evaluate the effectiveness of water quality regulatory programs in protecting beneficial uses of waters of the State.
2. Identify specific water problems preventing the SWRCB and RWQCBs from realizing beneficial uses in targeted watersheds.
3. Document receiving water conditions.

### ***Objectives***

Each of the following objectives will be implemented in order to fully develop and implement SWAMP. The objectives to be accomplished by November 30, 2000 are:

1. Establish advisory groups to review the design of SWAMP.
2. Strengthen relationships and data sharing capabilities with Department of Fish and Game (DFG); Department of Health Services (DHS); Office of Environmental Health Hazard Assessment (OEHHA); Department of Pesticide Regulation (DPR); and other federal, State and local agencies.
3. Specify the expectations of the monitoring and specify the management objectives for ambient monitoring.
4. Define monitoring strategies and indicators that address specific monitoring objectives.
5. Develop sampling designs.
6. Develop costs and schedules.

7. Develop proposal for a comprehensive monitoring program, including a mechanism to fund the program.
8. Develop report on the structure and effectiveness of water quality programs.

Once the comprehensive surface water monitoring proposal is completed, the following tasks will be initiated:

1. Implement monitoring program.
2. Report the information collected.
3. Disseminate the information and reports.

### ***Tasks to Implement SWAMP***

The tasks associated with each of the plan goals are presented below.

#### **Establish advisory groups to review SWAMP design**

Two committees will be established to support the development of the SWAMP. Members will be appointed to these groups by the SWRCB.

#### **Public Advisory Group**

Water Code Section 13191 (AB 982, Ducheny) requires that the SWRCB establish an advisory group or groups to assist in the evaluation of program structure and effectiveness in matters related to the implementation of CWA Section 303(d) requirements and other applicable regulations, as well as other monitoring and assessment programs.

The SWRCB will establish the Public Advisory Group (PAG) to assist in the development of SWAMP. An important function of this advisory group will be the integration of public concerns and expectations with the legal and regulatory framework of a monitoring program to help identify relevant, specific, and refined questions to be addressed.

#### ***Tasks***

The specific tasks for this activity are:

1. Announce and hold an organizational meeting for the PAG.
2. Schedule quarterly meetings of the PAG. Announce meetings on the SWRCB website.
3. Establish operating procedures for the PAG.
4. Solicit comments on various aspects of SWAMP (such as monitoring objectives, monitoring strategies, indicators, data analysis, data storage/retrieval and data

reporting). Solicit advice on the report to the Legislature regarding the development of a comprehensive monitoring program (due November 30, 2000).

5. Prepare written reports, as needed, to the SWRCB on the findings and recommendations of the PAG.
6. After the development of SWAMP, evaluate new tasks for the PAG to review (e.g., issues related to TMDL development and other Legislative reports).

#### Scientific Advisory Group

A second advisory group will be established to review the technical and scientific aspects of SWAMP. It will be the responsibility of this Scientific Advisory Group (SAG) to provide comments on the conversion of the general monitoring objectives into specific monitoring objectives that can be measured with available scientific approaches. The group will also review the program's monitoring approach and provide suggestions for monitoring improvements. The SAG will be comprised of independent scientific and technical experts including but not limited to the fields of toxicology, ecology, microbiology, organic and inorganic chemistry, experimental design, statistics, bioaccumulation, public health, pesticide management, monitoring program implementation, and quality assurance. The SAG should not have members from the staff of agencies implementing SWAMP.

The SAG will be established after the monitoring objectives are clearly defined.

#### **Strengthen relationships and data sharing capabilities with DFG, DHS, OEHHHA, DPR, and other agencies**

Ambient monitoring is performed by and supported by a number of federal, State, and local agencies. In order for SWAMP to be comprehensive and to not overlap existing efforts it is necessary to involve federal, State, and local agencies as full partners on the development and implementation of SWAMP.

#### Tasks

The specific tasks for this activity are:

1. Identify ambient monitoring programs that may have an influence on SWAMP.
2. Solicit the participation of agencies in the development and implementation of SWAMP. An agency task force may be established.
3. Involve these agencies in the implementation of SWAMP as either the organization performing the monitoring (e.g., DFG performs the monitoring activities of SWRCB's Mussel Watch Program) or as coordinators of the studies (e.g., OEHHHA oversees performance of SWRCB's Fish Contamination study). Improve data sharing capabilities.

### **Specify the expectations of the monitoring and specify the management objectives**

From the SWRCB and RWQCBs perspective, the ultimate goal of monitoring is to produce information that will be useful in making management decisions. Useful information depends on clear monitoring objectives.

#### Tasks

The specific tasks for this activity are:

1. Develop staff report(s) for the advisory group to facilitate discussion of the general monitoring objectives and to define spatial and temporal scales of SWAMP.
2. Hold workshop(s) to specify the monitoring objectives.
3. Revise and specify the monitoring objectives, as appropriate.
4. Include revised monitoring objectives in the comprehensive surface water monitoring plan. This will form the foundation for the next activity.
5. Periodically refine specific monitoring objectives. Refinements should be considered during program implementation and after collected data are reported.

### **Define monitoring strategies that address specific monitoring objectives**

A monitoring program design should incorporate a strategy to narrow the focus of monitoring from a large number of questions and parameters that could be measured to those that will produce the specific information needed. Without clearly stated testable questions, monitoring can result in a collection of data largely unusable for decision making. This analysis ensures that the monitoring is relevant to the natural processes and the environmental quality and human health objectives established early in the technical design.

#### Tasks

The specific tasks for this activity are:

1. Identify the environmental resources at risk.
2. Delineate the spatial, temporal, biological, and physical/chemical boundaries of the system.
3. Identify strategies to use to answer specific monitoring questions.

### **Identify available indicators that can be used to represent impacts**

One of the most important steps in the development of an ambient monitoring program is the selection and use of indicators of water quality. Indicators are the tools used to assess and measure water quality.

### Tasks

The specific tasks for this activity are:

1. Identify criteria to use as a basis for selecting environmental indicators.
2. Select indicators based on the identified criteria.

### **Develop sampling designs**

The information developed in the previous three activities determines the sampling design. The design states what variables will be measured and where and when the measurement will be taken. The following steps will help ensure that the sampling and measurement design will be appropriate to the questions upon which the monitoring is based (NRC, 1990).

### Tasks

The specific tasks for this activity are:

1. Determine meaningful change in indicators. The goal of a sampling design is to be able to detect specific kinds and amounts of change in the resource at risk, in surrogate variables related to the resource, or in parameters involved in model validation. Meaningful change is based on the testable questions developed in defining the study strategy. All kinds and levels of change are not equally important. It is therefore not possible to decide what parameters should be measured until a determination is made about which kinds and levels of change are meaningful.
2. Assess and incorporate sources of natural variability. Natural variability creates a background of change that may make it difficult to quantify environmental responses to human activity. Defining meaningful change will depend in part on identifying and accounting for natural sources of variability. Natural variability affects sampling design in two ways. First, natural changes may be so large that they mask changes of human origin. Second, random or periodic variations not accounted for in the sampling design can result in noise or false signals that make it difficult to determine the response of the ecosystem.
3. Select variables to measure. SWAMP will undoubtedly not have the necessary resources to monitor all variables of concern. The limited resources available must then be focused on the system attributes that are of the greatest concern and provide the most information about system status or change in status. It will be necessary to sample surrogate variables. These may include resources of intrinsic importance such as economically important species or endangered species.
4. Develop sampling design and its statistical basis. The sampling design provides the logical structure of the monitoring program because it specifically defines how questions will be evaluated and how variation associated with different sources will be measured.

5. Incorporate quality assurance into SWAMP sampling design.

#### **Develop proposal for a comprehensive monitoring program**

The SWRCB is required, in part, by Water Code Section 13192 to prepare a report to the Legislature on the SWRCB's and RWQCBs current surface water quality monitoring programs for the purpose of designing a proposal for a comprehensive surface water quality monitoring program for the State. This step will require the combination of monitoring objectives, sampling design, indicators, and other factors developed for the SWAMP design. Additional information will be included: estimates of costs, fee structure, and other factors.

The report is required to include a proposal for the program, including steps and costs associated with developing the full program, cost of implementation of the program after development, and appropriate funding mechanisms, including any fee structure. The SWRCB is allowed to include information required to be submitted to the USEPA pursuant to CWA Section 305(b), information required to be submitted under Water Code Section 13181(c)(1), and any information required to be submitted to the Legislature by the Supplemental Report of the Budget Act of 1999.

In considering and designing the proposal, the SWRCB is required to address factors that include, but need not be limited to, all of the following:

1. Physical, chemical, biological, and other parameters about which the program shall collect and evaluate data and other information and the reasonable means to ensure that the data is accurate in determining ambient water quality.
2. The use of models and other forms of information not directly measuring water quality.
3. Reasonable quality assurance and quality control protocols sufficient to allow sound management while allowing and encouraging, where appropriate, data collection by entities, including citizens and other stakeholders, such as dischargers.
4. A strategy to expeditiously develop information about waters which the State presently possesses little or no information.
5. A strategy for assuring that data collected as part of monitoring programs and any associated quality assurance elements associated with the data collection will be made readily available to the public.
6. A strategy for assessing and characterizing discharges from nonpoint sources of pollution and natural background sources.
7. A strategy to prioritize and allocate resources in order to effectively meet water quality monitoring goals.

### **Develop report on the structure and effectiveness of water quality programs**

By November 30, 2000 and annually thereafter until November 30, 2002, the SWRCB shall also report to the Legislature on the structure and effectiveness of its water quality programs as related to CWA Section 303(d). The report may include information required for submittal to the USEPA pursuant to CWA Section 305(b), as well as any other information required for submittal pursuant to the Budget Act of 1999.

#### Tasks

The specific tasks for this activity are:

1. Assess pathways for introducing ambient monitoring information into decision-making (e.g., planning, core regulatory, nonpoint source, enforcement, cleanup planning, and TMDLs).
2. Prepare report on structure and effectiveness of water quality programs related to CWA Section 303(d).

### ***Timeline for completion of the reports required by AB 982***

Developing the proposal for a comprehensive surface water monitoring program will be completed by November 30, 2000. The timeline with estimate on the time it will take to complete each task is presented in Figure 1. As indicated in the figure, all activities will be completed within one year.

### ***SWAMP Implementation***

After the monitoring proposal required by AB 982 is completed, the SWRCB and RWQCBs will begin implementing the program. These activities will be completed using funding proposed for FY 2000-01.

### **Implement the monitoring program**

During this phase of the program the monitoring data are collected and analyzed.

#### Tasks

The specific tasks for this activity are:

1. Develop request for proposal(s). Require that costs for services and a schedule for implementing SWAMP are presented.
2. Request proposals from State agencies, the University of California, California State University, or the private sector.
3. Review proposals.
4. Seek SWRCB approval to develop contract or interagency agreements to implement SWAMP.



5. Develop contracts or interagency agreements to implement the SWAMP. This agreement should be flexible enough to accommodate changes as SWAMP implementation begins. Task order contracts provide the best balance of flexibility and accountability for the monitoring program.
6. Track completion of SWAMP implementation. Periodically report on progress.

### **Report the information collected**

The raw data in a monitoring program frequently do not directly address public concerns or the information needs of decision makers. Data are individual facts which has to be processed, synthesized, and organized to produce useful information. A well designed monitoring program provides knowledge or a mechanism to ensure that knowledge is used to convert data collected into information.

#### Tasks

Conversion of monitoring data into monitoring information will be accomplished in two steps:

1. Provide a data management system accessible through the World Wide Web. The SWAMP data management activities will provide easy access to the collected data and related information. Due to the amount and complexity of the data collected and the variety of reports and analyses generated by a monitoring program, the data and all reports will be made available on the SWRCB web site. The new data generated will be stored on the SWRCB web site (a central location); other information will be accessed through links to other data management systems.
2. Complete data analysis and modeling. The goal of analysis activities is to summarize and simplify the collected data, test for change and differences, generate hypotheses, determine the consequences of observations, and evaluate the uncertainty associated with conclusions drawn from the data. To the extent possible, analysis programs will be developed prior to data collection. These should include both statistical testing and modeling to ensure that the analysis approach is appropriate to the sampling design and sampling methods.

### **Disseminate the information and reports**

An important aspect of any ambient monitoring program is the availability of the data. For the monitoring program to be effective, the data must be made available so that the fullest use can be made by the SWRCB, RWQCBs, scientists, dischargers, and the public.

#### Tasks

The specific tasks for this activity are:

1. Make data available on the SWRCB web site. The web site should also have the quality assurance project plan and the database description.

2. Prepare reports on the information collected in SWAMP. To the extent possible, SWAMP will encourage the publication of the data in scientific journals. Since it is possible that SWAMP will extend over several years, it is necessary that interim results be disseminated on a regular basis. This allows information users to determine whether the type and volume of data needed are being obtained.

FIGURE 1: TIMELINE FOR IMPLEMENTATION OF SWAMP



